



# SOAR SYNTHESIS OF ARCTIC RESEARCH



## Physics to marine mammals in the Pacific Arctic

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## SOAR Phase II – Deep Sea Research II Special Issue



### Abstract

The Synthesis of Arctic Research (SOAR) brings together a multidisciplinary group of Arctic scientists and Alaskan coastal community representatives to explore and integrate information from completed and ongoing marine research in the Pacific Arctic ([www.arctic.noaa.gov/soar](http://www.arctic.noaa.gov/soar)). SOAR was initiated in 2011 with funding from the Bureau of Ocean Energy Management (BOEM) to increase scientific understanding of the relationships among oceanographic conditions (physics, chemistry, sea ice), benthic organisms, lower trophic pelagic species (forage fish and zooplankton), and higher trophic species (i.e., seabirds, walrus, whales) in the Pacific Arctic. The first phase of the synthesis resulted in a special issue of *Progress in Oceanography* comprised of 17 papers:

<http://www.sciencedirect.com/science/journal/00796611/136>



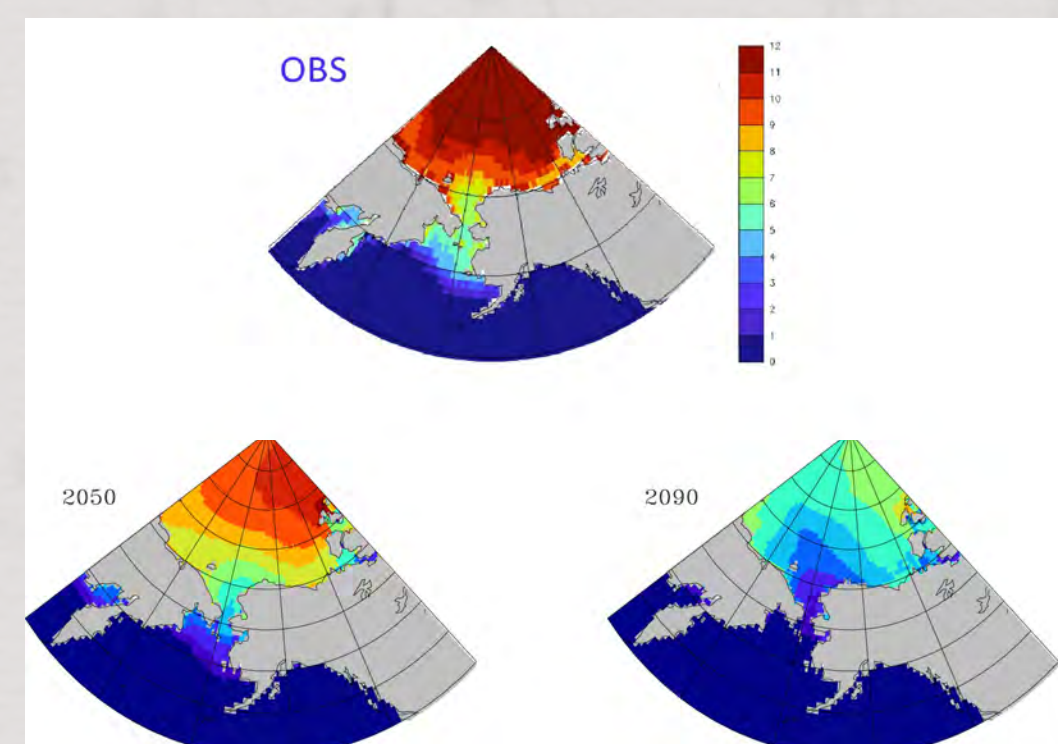
### SOAR Phase II

The second Phase of SOAR will build upon this initial synthesis with a second special issue in *Deep Sea Research II – Topical Studies in Oceanography*. This issue will be framed by the same three overarching themes: (1) The ‘New State’ of the Pacific Arctic sector: Observations and models of sea ice loss, effects on primary production and acoustic ecology (6 papers); (2) Responses of mid-level trophic species to the ‘New State’ of the Pacific Arctic: Benthic and pelagic invertebrates and forage fishes (3 papers); and (3) Responses of upper-trophic species to the ‘New State’ of the Pacific Arctic: Marine mammal and seabird distribution, relative abundance, and phenology (6 papers). A complete list of SOAR Phase II Special Issue papers and contributors is available online at:

[http://www.arctic.noaa.gov/soar/SOAR\\_projects\\_2.shtml](http://www.arctic.noaa.gov/soar/SOAR_projects_2.shtml)



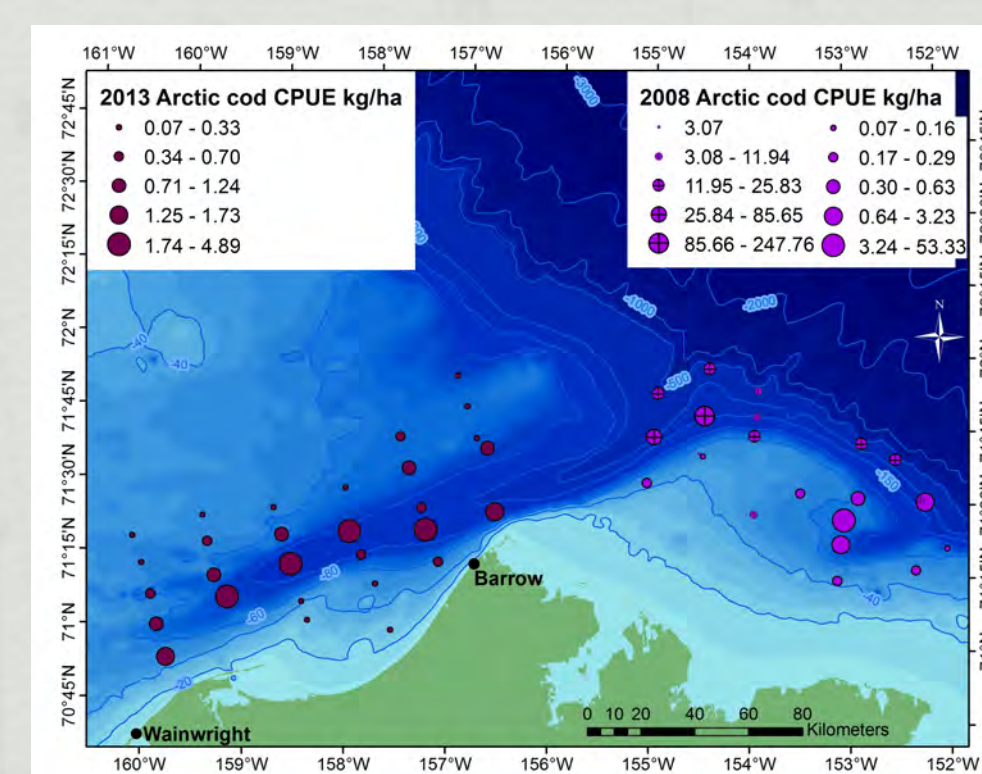
### Theme 1: “New State” Biophysics



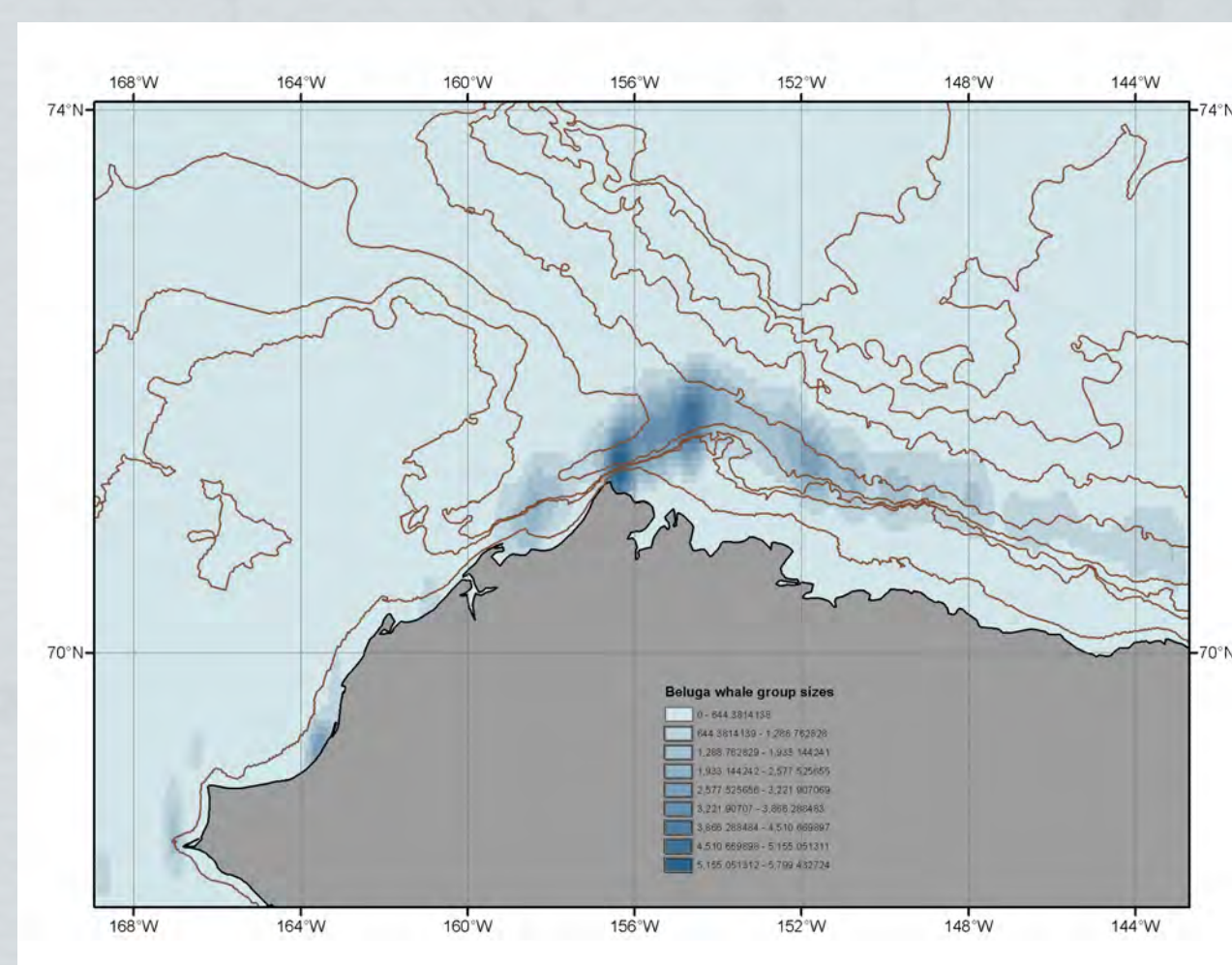
**Wang et al. 2015**  
Decadal mean of the number of months that has sea ice presence at each grid point (>15%) based on observation (top panel) and the average of 12 models under emissions scenario RCP8.5. Decadal means are shown for 2050 and 2090.

### Theme 2: Marine Bird and Mammal Prey Responses

**Logerwell et al.** Catch-per-unit-effort (kg/ha) of Arctic Cod from the 2013 Chukchi Sea survey and the 2008 Beaufort Sea survey (Logerwell et al. 2011). Symbols for the 2008 Beaufort Sea survey with crosses indicate catches with the lined bottom trawl, plain symbols for both surveys indicate the unlined bottom trawl.



### Theme 3: Marine Bird and Mammal Responses



**Stafford et al.**  
Kernel densities of beluga whales from aerial surveys.

Moore, S.E. and P.J. Stabeno. The Arctic Marine Pulses (AMP) model: Linking contiguous domains in the Pacific Arctic Region.

J.N. Cross, .T. Mathis, R. Pickart, and Bates. Formation and transport of corrosive water in the Pacific Arctic Region.

M. Wang, Q. Yang, M. Sullivan, P. Stabeno. Sea ice and ocean characteristics in the Chukchi Sea by selected CMIP5 models: The present and the future.

N.A. Bond, P.J. Stabeno, S. Danielson, and K. Wood. Diagnosis of physical oceanographic events in the Chukchi Sea using an ocean reanalysis.

K. Frey, J.C. Comiso, J.M. Grebmeier, L.W. Cooper. Trends in sea ice cover, sea surface temperature, and chlorophyll biomass across a marine Distributed Biological Observatory in the Pacific Arctic Region.

J. Overland, J. Walsh, and M. Wang. Large-scale warming and circulation shifts of the Alaskan marine Arctic atmosphere over previous decades.

V. Hill, D. Varela, S.H. Lee, M. Ardyna, and P.J. Stabeno. Measurements of *in situ* primary production in the Beaufort and northeast Chukchi seas.

J.M. Grebmeier, J. Clarke, L.W. Cooper, K.E. Frey, M. Kedra, and S. Vagle. Barrow Canyon: A high biodiversity hotspot in the Pacific Arctic.

E. Logerwell, K. Rand, L. de Sousa, and S. Danielson. Environmental drivers of benthic fish distribution in and around Barrow Canyon in the northeastern Chukchi Sea and western Beaufort Sea.

L.L. Moulton, B.A. Morris, J.C. George, T. Sformo. Trends in growth, condition and abundance of anadromous fish across Alaska’s Arctic Coastal Plain, 1985 - 2015.

M. Druckenmiller, J.C. George, J. Citta, et al. Trends in sea ice cover and upwelling potential within bowhead whale use areas in the Western Arctic.

M. Cameron, J. Lovvorn, S. Jewett, A. Whiting, B. McClintock, J. London, J. Goodwin, P. Boveng. Influence of benthic communities and environmental characteristics on bearded seal habitat for migration, foraging, and resting.

J. Citta, P. Boveng, M. Cameron, J. Crawford, K. Frost, J.C. George, J. Goodwin, L. Harwood, M.P. Heide, et al. Seasonal distribution and overlap of marine mammals in the Bering, Chukchi, and Beaufort seas.

K. Stafford, M. Guerra, C. Berchok, S. Okkonen. Acoustic ecology of bowhead and beluga whales in core use areas in the Beaufort and Chukchi Seas.

K. Stafford, R. Suydam, J. Citta, J. Clarke, M. Ferguson, C. Berchok, J. Jones, S. Okkonen. Beluga whales in the Beaufort Sea: A synthesis of available information on timing, distribution, habitat use, and environmental factors.

M. Robards, H. Huntington, J. Omelak, J. Raymond-Yakoubian, V. Metcalf, A. Whiting, et al. Understanding and adapting to observed changes in the Alaskan Arctic – Local actors in a global environment.

## SOAR Phase I Completed Progress in Oceanography Special Issue

- 17 Synthetic papers, including 4 Open Access articles
- Contributions from more than 100 Arctic scientists and local experts
- Over the decade 2004–2013 dramatic environmental changes in the Pacific Arctic suggest a ‘new normal’ climate is emerging.
- Variable advection and hydrographic processes are key influences on benthic hotspots for seabird and marine mammal predators.
- Six bowhead whale core-use areas are identified, and body condition suggests bowheads are faring well despite sea ice loss.
- The Arctic Marine Pulses (AMP) conceptual model aims to link the concept of contiguous domains to existing pelagic-benthic coupling and advective models to provide an integrative approach to ecosystem assessment.

[www.arctic.noaa.gov/soar](http://www.arctic.noaa.gov/soar)

